REMARKS/ARGUMENTS

Claims 1, 4-15 and 17-32 are active.

Claims 1 and 12 are amended to define that the high refractive index layer comprising the mixed silicon zirconium oxide is above the functional layer.

Claims 1, 4, 12, 17, 18 and 19 have been amended to further define the refractive index in accordance with the disclosure at page 8, lines 25-27 and the Table on page 15.

No new matter is added.

Applicants thank Examiners Nelson and Sample for the courtesy of discussing this case with their undersigned representative on October 9, 2009. During this meeting the amendments to the claims submitted in this paper were discussed. It was also explained why the prior art would not have been modified to increase the Zr content because of the intrinsic stress issues.

Further details on these points in the context of the rejections of record are outlined below.

The claims of this application are directed to a transparent substrate having an antireflection coating. A particular feature of this laminate is that at least one of those layers, in particular the high refractive index layer, comprises a mixed silicon zirconium nitride having a specified ratio of the Si and Zr. According to the specification on page 8 this selection of material provided advantages contrary to what was previously known about zirconium nitride as particularly absorbent when mixed with silicon nitride. The examples in the application use zirconium silicon nitride compared to other laminates having silicon nitride (examples 1 and 2 versus 3 and 4) in which the advantages of the zirconium silicon nitride are summarized on page 18, last 2 paragraphs which discusses the prevention of color in reflection from being greatly modified as the angle of incidence varies and can undergo heat treatment without impairing the optical properties. Further comparative data

demonstrating improved performance is shown in examples 6 and 7 (page 25), example 8 for solar protective performances (page 26) and the table on page 29 using aluminum zirconium nitride as comparative material.

In the Official Action, the Examiner has rejected Claims 1, 4-11, 28 and 30 as being obvious in view of WO 01/37006 (Joret) using the U.S. equivalent, US patent number 6,924,037 combined with Wolfe, US patent number 5,563,734.

The Wolfe patent is also cited by itself (see page 5 of the Official Action) to allege that Claims 12, 13, 16 and 20-22 would have been obvious.

As apparent from the amended claims (see Claims 1 and 12), the layer above the silver layer is defined as having a refractive index of about 2.20 to about 2.25. Wolfe, which is relied upon in both rejections, describes that the refractive index must be limited for the second dielectric layer (i.e., the one placed above the silver layer) where a SiZrN composite film is used. Applicants understand that the Office has already recognized this (see page 3, last paragraph and page 6, lines 3-6 of the Action) but considered this to be optimization based on Wolfe in col. 3 (lines 27-35) who discusses that the refractive index can be varied to achieve different light transmission and the data we have previously provided shows that when the variance in the ratio alters the refractive index.

Applicants explained that what Wolfe describes in col. 3 does not actually give any indication that the parameter in question here (the percentage of zirconium within the high index layer is such that Si/Zr is 4.6 and 5--see Claim 1) is a result-effective variable. All that Wolfe describes is "The refractive index of the composite films will vary depending on the relative amounts of the different nitrides that comprise each film." This not an indication that the percent of Zr is a result-effective variable.

Further, the reason why Wolfe has required the second dielectric layer between 1.98 and 2.08 becomes apparent when Wolfe's teachings in col. 4, lines 38-41 are taken into

consideration where Wolfe discussed that the layer should exhibit a low intrinsic stress. (See attached Declaration at ¶7).

Indeed, contrary to the conclusion raised by the U.S. patent office, one would not have increased the Zr content because it was thought that increased Zr would increase the intrinsic stress, something Wolfe clearly states is not desirable. (See attached Declaration at ¶8). Intrinsic stresses develop during the sputtering deposition of materials. These stresses are not due to lattice mismatch or thermal mismatch strains and are therefore called intrinsic stresses or growth stresses. These stresses arise because films are deposited under non-equilibrium conditions. In general, any redistribution of matter will result in film stresses, since the film is constrained by the substrate. A volume expansion of the thin film results in compressive stresses, while volume shrinkage results in tensile stresses. (See attached Declaration at ¶9).

The passage reproduced in the attached Declaration at ¶10 explains the phenomenon in more detail. Concerning the doping of Si_3N_4 with zirconium, the addition of Zr in the material leads to the increase of the compressive strength, as indicated in table 1 that gathers experimental data (See attached Declaration at ¶11).

While Applicants have found that increased Zr content does increase intrinsic stress as well, however, the effect was not as great as would have been expected and indeed rather limited, contrary to what Wolfe teaches. Therefore, Applicants have found that with the increased Zr content, improvements in the optical properties of the antireflective stack are achieved as explained in the previously submitted Declaration of Ms. Roche (September 24, 2008 filing) but also permit the heat treatments that are also required. That both of these features could be achieved with the increased Zr content, particularly, in view of Wolfe with or without the Joret citations, would not have been reasonably expected.

The examples in the application use zirconium silicon nitride compared to other laminates having silicon nitride (examples 1 and 2 versus 3 and 4) in which the advantages of the zirconium silicon nitride are summarized on page 18, last 2 paragraphs which discusses the prevention of color in reflection from being greatly modified as the angle of incidence varies and can undergo heat treatment without impairing the optical properties. Further comparative data demonstrating improved performance is shown in examples 6 and 7 (page 25), example 8 for solar protective performances (page 26) and the table on page 29 using aluminum zirconium nitride as comparative material. Also previously submitted is a Declaration presenting additional information as to the importance of the ratio between 4.6 and 5.

Applicants explained that the silicon zirconium nitride material provides improved performance as well as mechanical durability would not have been expected from what was known about the material prior to the present application.

Withdrawal of the rejections citing Wolfe and Wolfe and Joret is requested.

Combinations of certain claims are rejected combining Wolfe and Naudaud or Joret, Wolfe and Kimock or Kida for the purpose of finding limitations of those dependent claims. These references when combined with Wolfe or Joret do not remedy the core deficiencies of Wolfe and Joret as discussed above. That is, neither Joret nor Wolfe describe the arrangement of the layer having a refractive index of about 2.20 to about 2.25 in relation to the functional layer nor the advantages of this coupled with Applicants' discovery that when Si3N4:Zr is used rather than Si3N4, a good antireflective coating with a thickness of silver which can be increased (low E stack and control solar stack has a better efficiency) or with the same thickness of the silver layer. That Si3N4:Zr provided such a benefit is not suggested by the cited references when combined and indeed the attached Declaration

explains why one would not have modified the Si/Zr ratio and why the advantages they have discovered are surprising and unexpected in view of the common knowledge in the art.

In view of the above, it is requested that all of the rejections under 35 USC 103(a) be withdrawn.

A Notice of Allowance is also requested.

Respectfully submitted,

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